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After Action Report

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13. ABSTRACT ***(Maximum 200 Words)***

Army Experiment 5 (AE5) was a Chief of Staff of the Army (CSA) initiative devoted to "Training Army XXI Leaders to Exploit Situational Awareness". Responsibility for AE5 resided with the U.S. Army's Training and Doctrine Command (TRADOC), Deputy Chief of Staff for Training (DCST). AE5 conducted training focused experiments and showcased its results at the Association of the U.S. Army (AUSA) annual meeting in Oct 98.

The objectives of AE5 were: to support the development of a Digital Leader's Reaction Course (DLRC) proof of principle; identify methods for optimizing the use of situational awareness; support the implementation of emerging training strategies for Army XXI; enhance training and training support systems for leaders of digitized units; leverage early user capabilities of emerging training systems; and present the results at the Association of the United States Army (AUSA) annual meeting.

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Executive Summary

Army Experiment 5 (AE5) was a Chief of Staff of the Army (CSA) initiative devoted to "Training Army XXI Leaders to Exploit Situational Awareness". Responsibility for AE5 resided with the U.S. Army's Training and Doctrine Command (TRADOC), Deputy Chief of Staff for Training (DCST). AE5 conducted training focused experiments and showcased its results at the Association of the U.S. Army (AUSA) annual meeting in Oct 98.

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In order to accomplish these objectives, AE5 was executed along 4 "axes" of effort:

1. Axis Training Assessment. Training insights were captured and the Three-Step Training Process was assessed as a valid digital learning strategy: Step 1 learn the basic traditional skills, including the Military Decision-Making Process, Step 2 learn the hardware and software of Army Battle Command Systems (ABCS) through formal instruction and train in a tactical context and Step 3 practice execution repetitively in tactical scenarios executed in a crawl, walk, run progression with frequent after-action reviews (AARs). Final results are in the AE5 Assessment Report on the AE5 website (see below)
2. Axis Leavenworth. A DLRC proof of principle was developed and a Digital Training Experiment (DTE) was conducted from 22 June – 17 July 1998 at Fort Leavenworth, KS. Command and General Staff College (CGSC) faculty and students role-played brigade commanders and staffs, who used a PC wargame, Decisive Action, to hone their basic tactics skills, then they were challenged to make timely tactical decisions in a digitized environment created with the Eagle-ModSAF simulation linked to Army Tactical Command and Control Systems (ATCCS) and digital AAR tools.
3. Axis Hood. The Digital Training Exercise (DTX) for the 1st Brigade, 4ID, from 10-14 August 1998 at Fort Hood, TX was a train-up for the Force XXI Battle Command for Brigade and Below (FBCB2) Limited User Test (LUT). AE5 provided training support tools such as digital AAR tools and a Mission Planning Rehearsal Tool (MPRT) for conducting digital rock drills. AE5 supported the integration of the Close Combat Tactical Trainer (CCTT) with the Aviation Combined Arms Tactical Trainer - Advanced Reconfigurable Manned Simulator (AVCATT-ARMS), which allowed air and ground crews of the 4th Brigade, 4ID to conduct simultaneous combined arms collective training in preparation for their National Training Center rotation.
4. Axis Presentation. AE5 culminated with the exhibit during the AUSA meeting 12-14 October, in the Cotillion Ballroom of the Marriott Wardman Park Hotel. This showcased the training methods, tools, and insights that resulted from the experiment. The exhibit included a main theater video presentation highlighting AE5's efforts to show how the Army is meeting the challenges of the 21st century. It also included four presentation theaters which described Combined Arms Collective Training (CCTT & AVCATT-A),

Home Station Training (Ft Hood DTX), Institutional Training (DLRC DTE), and Leader Development Training (Decisive Action wargame).

A website was established at http://www.armyexperiment.net to provide information regarding AE5 and the Army Experiment program in general. An AE5 CD-ROM was also developed that included an AE5 overview, ABCS primer, and a version of the Decisive Action wargame that was provided to attendees of the AE5 exhibit at AUSA.

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1.0 INTRODUCTION

1.1 FORWARD

Letter from Director ...(to be provided by DCST)

1.2 SCOPE

This AE5 After Action Report contains an introduction, overview of AE5, a description of the experiments at Fort Leavenworth, the exercises at Fort Hood, the AUSA presentation, the AE5 deliverables, and the conclusions based on the AE5 results.

1.3 APPLICABLE DOCUMENTS

1.3.1 Government

Advanced Distributed Simulation Technology II (ADST II) Statement of Work (SOW) (Version 2.1, Document AMSTI-94-W006, dated 22 Oct 96).

1.3.2 Non-Government

AE5 Experiment Plan Contract Data Requirement List (CDRL) AB01 #ADST-II-CDRL-AE5-9800182, dated 28 August 1998.

AE5 Strategy Plan CDRL AB02 #ADST-II-CDRL-AE5-9800350, dated 30 October 1998.

1.4 ARMY EXPERIMENT WEBSITE

The Army Experiment (AE) Internet website is located at http://www.armyexperiment.net. The website contains a guided overview of the AE5 project as well as information on the Army's Battle Command Systems (ABCS) and the Army Tactical Command and Control Systems (ATCCS).

1.5 PAST ARMY EXPERIMENTS

The AE program traces its history back to 1994. It was not known by its present AE title back then, but was executed by the Louisiana Maneuvers Task Force (LAMTF). In that year, the Army began an annual presentation at the AUSA convention to highlight its actions to harness the unprecedented explosion in technology in its efforts to modernize its forces. AE3 began the use of the AE designation for the program. The first two presentations were subsequently back-named AE's 1 and 2. A complete list of the AE's that have been conducted to date, along with accompanying themes, follows:

AE1: Synthetic Theater of War-Europe (STOW-E)
AE2: Force Projection Tactical Operation Center (TOC)
AE3: Distributed Multi-Level Simulation
AE4: Shaping the Force with a Full Spectrum Force
AE5: Training Army XXI Leaders to Exploit Situational Awareness

The series of AEs are CSA initiatives that were previously conducted using the LAMTF as the executing agency. Upon dissolution of LAMTF on 1 July 1996, the mission for conducting the experiment was assigned to TRADOC. The Chief of Staff, TRADOC,

subsequently assigned the mission to Deputy Chief of Staff for Combat Developments (DCSCD) and it was further assigned for execution to the Battle Lab Integration, Technology and Concepts Directorate (BLITCD). As executing organization, BLITCD was responsible for planning, coordinating and executing the AE. Demonstration of each AE, as a part of the CSA's strategic communications plan, provides a means to communicate a specified message to government officials, the public, industry, academe and the Army.

While the AE effort has always had a training flavor, its focus through AE4 was primarily doctrine, organization, and materiel oriented. For AE5, the TRADOC Commander transferred responsibility from the DCSCD to the DCST and the focus shifted to training and leader development. Specifically, the program was targeted at developing the digital training environment and methodologies required for units, institutions, leaders and soldiers to keep pace with the modernization of the Army brought on by the information-age technology advances. This allows the Army to cope with the order of magnitude increase in situational awareness brought on by a digitized battlefield.

2. OVERVIEW OF AE5

2.1 COMMAND GUIDANCE

AE5 was conducted by the TRADOC DCST during Fiscal Year 1998 (FY98). AE5 consisted of a series of training experiments followed by a culminating presentation at the AUSA meeting in Washington, DC, 12-14 October 1998. The experiments were executed in an unclassified mode to allow for presentation at the AUSA meeting. AE5 was the latest in a continuing series of annual AEs initiated by the CSA for the Army to prepare for the battlefield of the future. AE5 was devoted to "Training Army XXI Leaders to Exploit Situational Awareness."

2.2 OBJECTIVES

The objectives of AE5 were to:

1. Support the development of a DLRC proof of principle,
2. Identify methods for optimizing the use of situational awareness,
3. Support the implementation of emerging training strategies for Army XXI,
4. Enhance training and training support systems for leaders of digitized units,
5. Leverage early user capabilities of emerging training systems, and
6. Present the results at the AUSA annual meeting.

2.3 SCHEME OF MANEUVER

AE5 accomplished its objectives through four major "axes" of effort: Axis Training Assessment, Axis Leavenworth, Axis Hood, and Axis Presentation. Axis Training Assessment included capturing training insights and assessing the Three-Step Training Process. Axis Leavenworth included the development of a DLRC proof of principle. Axis Hood included a DTX for the 1st Brigade (BDE) Combat Team (BCT) of the U.S. Army's 4th Infantry Division (4ID) and integration of CCTT and AVCATT-A for combined arms training in a virtual battlefield environment. Axis Presentation included the AE5 presentation at AUSA.

2.4 CONCEPT

The AE5 concept concentrated on how to better train Army XXI leaders to exploit situational awareness. AE5 focused on conducting experiments designed to enhance leader development and decision-making skills in a digital environment. A main residual was the DLRC Proof of Principle that was designed with leader execution drills to teach leaders to visualize the battlespace and make timely tactical decisions. The DLRC DTE occurred 13-17 July 1998 at Ft. Leavenworth with Command and General Staff College (CGSC) faculty and students participating as brigade commanders and staffs. AE5 conducted a DTX with 1st BDE/4ID, at Ft Hood, 10-14 August 1998, to assist in training the new brigade staff in preparation for the FBCB2 LUT. AE5 also supported the integration of the CCTT with the AVCATT-A for the 4th BDE to facilitate a training exercise using ground simulators with aviation simulators.

2.5 DESIRED RESULTS

- Deliverables
  - DLRC Proof of Principle
  - Battle Command Information Management Tools
  - Documented Process of Training Digitized Leaders
  - AE Web Site
  - Strategy Plan (Tenets for Future AEs)
- Residuals
  - Insights into the process leaders use to develop the skills required for the Force XXI Army
  - Initial Leader Execution Drills
  - Distance Learning Applications

2.6 MILESTONES

The milestone dates of AE5 are shown below in Figure 2.6-1.

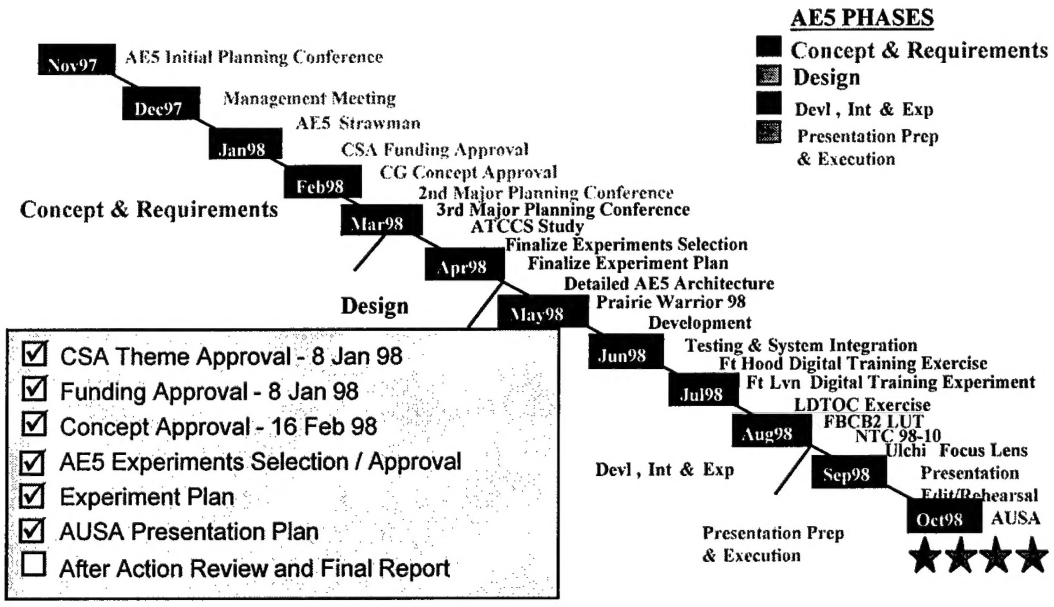

Figure 2.6-1 Milestones

3. EXPERIMENTS

3.1 OVERVIEW

The AE5 Training Assessment team took the original AE5 hypotheses and revised them into 2 central hypotheses with supporting hypotheses that pertain to AE5. These were then tailored for the Ft Leavenworth DTE and the Ft Hood DTX. The AE5 central hypotheses are as follows:

- Hypothesis 1 – A training approach using repetitive, realistic simulation-based exercises will improve leader and staff SA, enabling leaders to make better battle command decisions.
  - Supporting Hypothesis 1.1 – The training approach will result in a leader achieving proficient use of ABCS and supporting tools.
  - Supporting Hypothesis 1.2 – Proficient use of ABCS and supporting tools will result in better SA.
  - Supporting Hypothesis 1.3 – Varying the availability of situation information by source during C2 decision training will result in more comprehensive use of available information resources.
  - Supporting Hypothesis 1.4 – Using dynamic AARs repetitively during C2 decision training will improve leader and staff learning.
  - Supporting Hypothesis 1.5 – Using the DLRC to support C2 decision training will improve leader and staff learning.
- Hypothesis 2 – Leaders achieving mastery in command decision-making will be able to adjust the military decision-making process dynamically in response to situation requirements.

Assumptions

The following assumption were considered critical to the assessments:

- The exercise/experiment tolerance for data collection obtrusiveness will be enough to collect detailed and mental process data that is difficult to achieve even under ideal conditions.
- Adjusting to the resulting data collection obtrusiveness allowable will be satisfactory for making basic observations/assessments concerning the Military Decision-Making Process (MDMP) and Commander's Decision-Making.
- The anticipated task/learning process composition proposed in the training outlined by the 3 Step Training Process proves to be an adequate representation of the different training variables present in each of the separate processes.

3.2 AXIS LEAVENWORTH

3.2.1 DTE Hypotheses

DTE 1. A training approach using repetitive, realistic simulation-based exercises in a DLRC environment will improve the leader's situation assessment process, enabling leaders to make better decisions on the battlefield

DTE 2. Leaders achieving mastery level in command decision-making will adjust the MDMP dynamically in response to situation requirements.

DTE 3. Varying the availability of situation information by source during C2 decision training will result in more comprehensive use of available information resources.

DTE 4. Using dynamic AARs repetitively during C2 decision training will improve leader and staff learning proficiency.

DTE 5. Using the DLRC to support the 3 Step Training Process will improve the leader's execution proficiency in decision execution drills.

DTE 6. Proficient use of Army Battle Command Systems (ABCS) and supporting tools will result in better situation awareness.

The 3 Step Training Process as used for the DLRC DTE effort is summarized below.

- Step 1: Learn the basics. Learn the traditional basic skills to include the military decision-making process
- Step 2: Learn the hardware / software. Train on the ABCS hardware and software repetitively in tactical context that increase in complexity as proficiency increases.
- Step 3: Practice execution. In the CGSC DLRC environment, develop highly adaptive and proficient leaders that are competent and confident to perform current and likely new Force XXI missions. Step 3 consists of executing tactical scenarios of increasing difficulty (in an intense, immersion-based environment in a crawl, walk, and run sequence), accompanied by reflective thought and effective mentoring. As proficiency increases so will the mental agility of DLRC participants (in leader and primary staff roles), resulting in new ways to do things - executing, modifying, redoing. This will lead to modifications of Tactics, Techniques and Procedures (TTPs) and the MDMP (undoubtedly similar to Combined Arms Command (CAC's) on-going modifications to the Staff Leader Guide) and result in more effective and efficient use of the available information. Learning will occur in a spiral fashion, much like the spiral development approach to system development.

3.2.2 Experiment Design

AE5 executed a DTE from 22 June – 17 July 1998 at Fort Leavenworth, KS. The DTE supported the development of a DLRC in the WARLAB and the ATCCS classrooms in the CGSC. The DLRC taught Army XXI leaders to visualize the battlespace and make tactical decisions in a digitized, time-constrained environment as a proof of principle. The DLRC provided TRADOC and the Army at-large with a training unique operational capability, where leaders could enhance their Command & Control (C2) warfighting skills.

For assessment purposes two BDEs were compared against a third BDE to determine incremental improvements related to the three-step training methodology and dynamic AAR technologies. The third BDE did not participate in the second part of step 2 training (learn hardware/software in tactical scenarios). Rather, they just received their ATCCS platform/system instruction during the first part of step 2 training.

Step 1 training (learn the basics) incorporated a low overhead, Personal Computer (PC) - based simulation titled Decisive Action. In its original configuration, Phase I facilities (automated classrooms), taught CGSC students the art of C2 at Corps and Division levels. In AE5, Brigade-level leaders used Decisive Action to hone their execution skills through experiential learning. Each commander had the opportunity to execute plans developed through earlier planning sessions. Leaders were prompted to make tactical decisions based on changes in mission, enemy, terrain, time, training & civilian considerations (METT-TC) while simultaneously being task loaded through various stimuli. External stimuli included video teleconferencing, phone calls, Mission Oriented Protective Posture (MOPP) environment and complex battlespace events.

Step 2 training (learn the hardware & software in tactical context) was comprised of two parts. The first part provided users with baseline platform/system operation instruction. Part two placed the BDE Commander and his BDE Tactical Command Post (TAC) staff in C2V mockups. Like Phase I, Phase II was execution-centric. It focused on the BDE Commander and was designed to force him into making decisions in a time-constrained complex battlespace. In addition to the Step 1 training environment stimuli, commanders and staffs were introduced to synthesized radio traffic and virtual reality views for battlespace visualization. These virtual reality views provided commanders with an Unmanned Aerial Vehicle (UAV) and ground "stealth" view of the battlefield along with Maneuver Control System (MCS), All Source Analysis System (ASAS), and Advanced Field Artillery Tactical Data System (AFATDS). Part two training used the Eagle-Modular Semi-Automated Forces (ModSAF) ground-based combat model to stimulate these real world ATCCS, while it crawls/walks commanders and staffs through tactical vignettes.

Step 3 training (repetitively execute in tactical scenarios) placed the BDE Commander and his staff in rapidly progressing tactical situations. These BDE teams executed a plan during a vignette lasting not more than 4 hours in duration. Two BDE teams were then given a technology-assisted AAR where they reviewed the previously conducted battle while concentrating on the decisions the commander made. They were quickly placed back into a

like tactical scenario where their performance was assessed and compared to earlier execution cycles. The third BDE team received a "standard" Observer/Controller (O/C) led AAR at the conclusion of 12 hours of battle.

The DTE AARs were accomplished by using Vision XXI and the Digital After Action Review Technology (DAART) system. The large projection screens in the classroom had Vision XXI displayed on one screen and the DAART video images displayed on another screen. A third screen was used to display PowerPoint slides to assist in explaining the teaching points.

The Vision XXI system works by subscribing to the Run Time Interface (RTI) messages from the tactical Local Area Network (LAN) to capture message traffic and recreate the tactical information. The tactical information is then used to create snapshots of the battlefield and recreate the battlefield conditions in a PowerPoint slide at set intervals of the battle to facilitate discussion during the AAR. The commander can be shown his current position, be shown the course of action that was taken, and then discuss the reasons a given Course of Action (COA) was taken.

The DAART system works by capturing the screen images directly from the workstation output with a video-computer interface. For the DLRC, the images of MCS, ASAS, UAV, and a closed circuit image from each C2V were recorded. The DAART system is capable of capturing up to 12 channels of data for up to six hours. The data is then played back at normal speed or six times normal speed to recreate the battlefield information that was displayed on each workstation ATCCS. The area of interest that was displayed on a given ATCCS system is captured as well as the actions of the ATCCS operator. The DAART system is also capable of displaying one image or up to all 12 simultaneously. This allows the O/C to display all three MCS screens or all ATCCS from a given C2V, which focuses the AAR discussion on a key decision point during the simulation.

The 1/4 ID from Fort Hood used the DLRC systems at Fort Leavenworth from 8-11 September 1998 to validate the DLRC as a low overhead, effective training approach to challenging leaders to make timely tactical decisions in a digitized environment. Key comment from the Brigade Commander was that FBCB2 was needed as the Bde and below command and control system, as well as other battlefield dimensions such as ADA, CSS, BDA etc.

3.2.3 Lessons Learned[1]

3.2.3.1 Systems Development and Integration

The integration period at the WARLAB was originally scheduled for a period of three weeks (3 - 21 June). During this period, the DTE hardware setup was completed and ModSAF

[1] Lessons Learned, section 3.1.3, comments are from LTC Jeff Engbrecht, WARLAB Director, Fort Leavenworth, KS.

integration continued from the work previously conducted at TRADOC Analysis Command's (TRAC's) Virtual Laboratory. Delivery of Protocol Interface Unit (PIU) equipment did not occur until the second week of training. This precluded AFATDS platforms from being integrated into the experiment. Training and integration cannot be completed simultaneously.

Integration must be completed prior to training. Early determination and commitment of monetary assets is required for timely purchase of equipment. This will facilitate timely integration of required software and hardware platforms. The development of an Army Experiment "strategy plan" should permit early allocation of funds required to commence integration.

3.2.3.2 Network/Platform changes

Changes to systems caused simulation failures periodically. Any changes made to the network or the function of ATCCS platforms caused second and third order effects of the DLRC system.

Internet Protocol (IP) address alterations must be propagated throughout the network in each platform's host file. Failure to do so will result in an inability of system to pass information.

3.2.3.3 Changes to the Run Time Interface (RTI)

Changes to the RTI caused resulted in an inability on the part of Vision XXI to capture ground truth information from the simulation. Vision XXI interfaces with the Eagle simulation via output from the Run Time Interface. Therefore, each time the RTI is recompiled, there must be a corresponding change to the Vision XXI software.

Communication is the key here. Simulation & AAR personnel must know and disseminate when changes occur to the RTI.

3.2.3.4 Experiment Schedule

We were not able to conduct all originally scheduled tactical scenarios during Step 3 training. Due to the late integration of equipment and late acceptance testing, we were still making changes to systems during execution. As a result, we only accomplished 22 of 27 expected tactical missions.

The schedule must account for "down" periods in the simulation to make adjustments without compromising the experiment.

3.2.3.5 Very Important Person (VIP) Briefing plan

The VIP briefing plan was inadequate to support to volume of visitors and attendees to the DTE. The experiment working lead and exercise controller, were unable to adequately perform those duties while continuously escorting and briefing VIPs.

Designate and man a visitors coordination cell. Provide adequate facilities and equipment so VIPs do not impact the experiment. Additionally, provide a takeaway information folder/packet for attendees.

3.2.3.6 Observer/Controller package

The observer/controller team provided quality guidance and mentoring to the brigade commanders and staffs. "*One of the best ways to learn is from receiving sage advice from a seasoned O/C team.*" This comment was heard several times during the 1BCT 4ID exercise.

Expend the effort and money up front to employ a quality O/C package and get them involved in the scenario development.

3.2.3.7 Table of Distribution and Allowance (TDA) manning

The DTE TDA was not completed until three days prior to the first training event. In our best effort to sell a great and worthy program, we found a lack of volunteers to participate. Contrary to popular belief, the Command and General Staff College is a very busy place during the summer months. We first tried to convince each directorate of the benefits of participating in Army Experiment 5. We then used command influence from the Dean of Academics. We finally developed a tasker to fill the required positions.

Designate, task and man the TDA not later than one month in advance.

3.2.3.8 TAC CP positions

The use of four Soldiers (commander, operations officer, fire support officer, and intelligence non-commissioned officer (NCO) was necessary and sufficient for the DLRC. Although opposed at first, the 1st BDE, 4ID did not want to limit themselves to only 4 Soldiers operating out of the TAC CP. Their desire was to bring operators and primary staff officers. Being forced to rely on a staff of three forced the commander to rely on them and remain focused at the decision making at hand.

The mix of individuals was correct for the implementation of the DLRC at the Brigade level.

3.2.3.9 Network

The use of a closed network using routers to connect the WARLAB with the ATCCS classroom was not properly enacted. There were no changes to the network structure from the Prairie Warrior exercise conducted in May. There should have been no reason for our inability to pass traffic between the two locations. However, we were initially not able to pass network traffic. Consequently we made the decision to relocate the Division response cell and the OPFOR to the WARLAB.

Sufficient time should be planned for in the integration of equipment.

3.2.3.10 Supporting Equipment

Several pieces of vital equipment did not arrive until just prior to Step 2 training. Late commitment of money caused the late ordering and arrival of equipment necessary for the implementation of the DLRC.

Sufficient time should be planned for the purchase and integration of equipment.

3.2.3.11 After Action Review tools

AAR tools met with different levels of success. Vision XXI was used, albeit ineffectively, during after action reviews. DAART was never successfully employed as part of the AAR suite. The problem resulted from the lack of instruction provided to the O/C about the purpose and capabilities of AAR equipment.

Time must be allocated in the training schedule for the education of observer/controllers on AAR technologies.

3.2.3.12 Exercise Control Plan

An exercise control plan was never published. Dissemination of information is requisite for successful implementation of any exercise. The DLRC DTE is no exception. Morning "huddles" and use of a bulletin board indicating changes to the daily schedule were important for passing information to all parties concerned. However, a published exercise control plan with milestones would have gone a long way in educating participants and support personnel.

For all future exercises, publish an exercise control plan with milestones.

3.2.3.13 Execution

Each iteration of the DLRC focused on the execution of an already developed plan. The original intent behind the implementation of the DLRC was to have a brigade TAC CP fight an already developed plan. At times participants lost sight of this intent. Brigade commanders found themselves handcuffed by previously determined movement routes.

Development of common sense movement routes and courses of action by the exercise control cell is vital. We must also reiterate the intent of the DLRC periodically to participants.

3.2.3.14 Repetition of similar missions

Repetition of similar missions during both phases of the DTE enhanced learning. Comments from brigade commanders and assessment team members noted how applying lessons learned during the AAR session were easily applied through the repetition of similar tactical missions. Each felt this reinforced learning and made the learning curve less steep.

Retain this methodology in future instances of the DLRC.

3.2.3.15 Articulation of Fragmentary Orders

There existed no requirement for brigade commanders to articulate fragmentary orders to the O/C. The O/C is the key person who must capture the information necessary for the after action review. In this capacity, he needs to know when the commander is making a fragmentary order and the reason behind the issuance of that order.

Brigade commanders must convey their intent to the O/C to facilitate the AAR process.

3.2.3.16 Emergency Action Procedures

The simulation team, in concert with the exercise control team instituted emergency action procedures. In an environment, which is experimental in nature, rapid recovery of support systems is important to minimize idle time of Soldiers. We developed ad hoc emergency action procedures to recover from system failures. These procedures worked well, especially when combined with clear communication between the simulation and exercise control teams.

Formalize emergency action procedures into a DLRC standard operating procedure (SOP).

3.2.3.17 MCS tracking of BLUEFOR & REDFOR icons

1BCT, 4ID personnel were able to more easily visualize the battlespace by having both red and blue icons appear on the MCS screen. 1BCT, 4ID personnel became confident in using and trusting the icons. After a short time of maintaining an analog map, they were able to develop confidence in the electronic environment. O/C personnel pointed out that as the commander and staff become more confident and effective in the digital environment, degrading the red/blue picture would increase the difficulty level

Each tactical scenario used should have the ability to be degraded in terms of visibility to the commander and staff.

3.2.3.18 Eagle simulation protocols

Eagle successfully incorporated High Level Architecture (HLA) with Distributed Interactive Simulation (DIS) protocols. The Joint Technical Architecture mandates that all simulations utilize HLA for interconnectivity. Eagle's incorporation of HLA and DIS protocols was the first ever implementation which was capable of stimulating ATCCS platforms. All of this was accomplished using a small amount of support personnel.

Eagle shows promise in future implementations of the DLRC. It also supports the use HLA protocols as we posture for the future.

3.2.3.19 Eagle movement algorithm

When brigade staffs executed movement orders to subordinate units, the units often did not move in the desired direction. Eagle uses a movement algorithm, which employs a series of edges that units can move along. Often these edges cause units to miss their anticipated routes of movement and subsequently their enemy oriented objective.

The Eagle movement algorithm must be adjusted to permit commanders to dictate a route of march to ensure battlespace synchronization.

3.2.3.20 Eagle representations of Battlefield Operating Systems (BOS)

Eagle appropriately models three (C2, maneuver and fire support) of the seven BOS areas.

Recommended changes to BOS areas follow:

Intelligence: implement methods to task, control and monitor intelligence assets. Replicate employment of battalion level scout, mortar platoon and ground surveillance radar.

Mobility/Countermobility: permit engineers to create and reduce obstacles. Account for improvements in vehicular and infantry fighting positions.

Fire Support: employ mortar and artillery delivered smoke. Develop two-way interface with AFATDS. Account for varying munitions.

Logistics: replicate realistic, integrated and interactive logistics operations.

Air operations: replicate employment of close air support and air defense operations.

As we continue to mature the simulation, continue to enhance it's modeling of reality. Accurate BOS representation is vital to acceptance of users.

3.2.3.21 Simulation software

There was a continuous loss of available memory in various systems. The RTI must be upgraded to version 1.3. ModSAF must also be upgraded to the most current version to solve memory leakage problems. Failure to solve memory leakage problems will result in a simulation duration of only 2 hours.

3.2.3.22 Eagle voice synthesis

Voice synthesis of the brigade command net had different reactions from different brigade teams. Early in step 3 training, brigade commanders requested an increase in the number of messages sent into the C2V via synthesized voice to assist them in tracking their subordinate units. The 1BCT, 4ID Commander commented that there was so much traffic sent across the brigade command net, he disregarded all the synthesized voice. All commanders commented on the lack of voice quality.

We must refine the quantity and quality of oral reports. We should investigate ways to improve voice quality.

3.2.3.23 ATCCS versions

Antiquated versions of ATCCS software presented communication, interface and training challenges. In order to develop a two-way interface between MCS and Eagle, software developers had to choose a version of ATCCS software and work from that particular version. While establishing this interface, several significant improvements to ATCCS software occurred. The inability to use currently fielded software versions negated

communications between adjacent unit on MCS and the passing traffic from ASAS to MCS. It also precluded the use of Video-teleconferencing between echelons. Additionally, it presented a false picture to participants about the capabilities of fielded software. Training on ASAS proceeded very slowly because of instructor unfamiliarity with an older version of ASAS software.

If we expect to carry the DLRC effort forward, we must transition to current versions of ATCCS software. This will also require a concerted funding effort to make upgrades to the Eagle Federated Object Model software, when new drops of ATCCS software occur.

3.2.3.24 ASAS Relevant Common Picture

ASAS relevant common picture updates lagged in comparison to MCS updates. The architecture developed for the DLRC dictated a one-way interface between Eagle and ASAS software. In order to populate the ASAS platforms, protocol data unit traffic was routed through the Tactical Simulation Interface Unit. No such additional interface was required to stimulate MCS platforms. This caused a timing mismatch with MCS being updated quicker than ASAS. In the real world, ASAS processes the information received from sensors or other sources, analyzes it, and then sends it to MCS.

In order to model realistically, we must update the ASAS battlefield function area platforms and allow them to process the information before sending it to MCS.

3.2.3.25 Force XXI Battle Command Brigade and Below (FBCB2)

The DLRC did not incorporate FBCB2 into the architecture. A brigade commander will normally expect to employ FBCB2 in his TAC CP. FBCB2 permits him to communicate with his subordinate battalion commanders. The challenge of using FBCB2 to expand the DLRC into a staff Unit Conduct of Fire Trainer (UCOFT) is how to stimulate these systems.

FBCB2 should be included in the brigade C2V environment to provide operational realism.

3.2.3.26 Incorporate all ATCCS systems

AMDWS and CSSCS were absent during the conduct of the DLRC. Initially we wanted to focus our efforts on the systems a brigade commander would expect to find in an objective brigade TAC CP. In a short tactical fight, we expected to drive the brigade commander to a series of critical decisions and then review them. We believed it prudent to assume the other ATCCS systems would be present in the brigade TOC, not the TAC CP.

As we move towards a staff UCOFT, incorporation of the ATCCS suites becomes necessary.

3.2.3.27 Battle Staff Training System (BSTS)

The BSTS was difficult to install and manage. Fort Knox developed BSTS to assist in training individuals on doctrinal basics at the brigade level. We used BSTS at the end of step 1 training by administering the assessment (examination) to ensure all participants were trained. We experienced many difficulties loaded and administering the software. We were

unable to extract test results to give to the assessment team. As a result, we could only use the examination as a pass/fail testing instrument.

Use BSTS early in step 1 training as a pass/fail testing instrument.

3.2.3.28 Decisive Action

Decisive Action provided an excellent tool for support of step 1 training. Decisive Action facilitated and stimulated tactical decision making in a cost-effective manner. It provided reasonable outcomes for brigade developed plans, highlighting doctrinal lessons and forcing decisions. Use of video taping of briefbacks in conjunction with Decisive Action screen captures, were excellent tools to set the stage for AARs.

Continue to Decisive Action during step 1 training.

3.2.3.29 The 3 step training methodology

The 3 step training methodology was sufficient to provide trained leaders. Training the fundamentals, learning how to use the hardware and software in tactical scenarios and then repetitively executing tactical scenarios until actions became second nature proved an effective way to train Army XXI leaders to exploit situational awareness.

Continue to use this methodology in future exercises.

3.2.3.30 After Action Review (AAR)

AAR technology can provide a powerful tool in training leaders. We applied Vision XXI to capture ground truth information from the simulation and used DAART to capture system screens and a view of the TAC CP. During phase I of the DTE, we did not adequately train observer/controllers on the capabilities and potential applications of each system. Consequently, each did not achieve its maximum potential in the learning process. During phase II, observer/controllers were more knowledgeable on the use of these AAR technologies and applied them to the learning process.

Develop a scenario-based collection management plan. This should identify areas required for AARs. Conduct up front, in depth training on AAR system capabilities and applications.

3.2.3.31 Terrain

A mismatch existed between MCS, Eagle and Vision XXI terrain models. Each system used its own similar representation of National Training Center (NTC) terrain. However, as similar as these models were, there were still distinct differences when transposing unit movement from one system to another.

Develop a common terrain database used for all three applications.

3.2.3.32 Train the Trainer

No formal program exists to train the trainer. This will be one of the tests of success of the DLRC development. Skillful trainers will not happen automatically. Control of the learning

situation, providing clear task descriptions and training objectives, and standardizing measurement and feedback will greatly assist and support the trainers.

Develop a formalized program for training the trainers, which includes training support packages, use of technology assisted AARs, and a standardized measurement Training Exercise.

3.3 AXIS HOOD

3.3.1 DTX Hypotheses

DTX 1. If a leader follows the "3-Step Process," then the leader will significantly increase his or her ability to exploit situational awareness in a digitized force

DTX 2. If a leader attains or approaches a high degree of proficiency, then this will enable the leader to abbreviate the military decision making process, as appropriate.

DTX 3. If, during Step 3, leaders are placed in reduced states of situational awareness, then they will learn to use the full spectrum force.

DTX 4. If dynamic After Action Reviews (AARs) are repetitively used in Step 3, then learning will occur more effectively.

3.3.2 DTX Experiment Design

AE5 executed a DTX from 10-14 August 1998 at Fort Hood, TX. The 1st BCT/4ID provided personnel and equipment support for the execution of the FCBC2 LUT 17-31 August 1998. The DTX was a rehearsal in support of the FBCB2 LUT for the 1/4ID. The purpose of the LUT was to determine if the FBCB2 functions as a fully integrated interoperable architecture that provides:

1. Enhanced situational awareness,
2. Shortened mission decision cycle through the use of decision support functions,
3. Reduced fratricide based upon a common picture of the battlefield, and
4. Enhanced synchronization of combat power within and among combat brigades down to the platform/individual Soldier level.

In preparation for the FBCB2 LUT, 1st BCT conducted a training program beginning in May 1998 and concluded with the completion of the LUT. The focus for the training was on platoon lanes, Simulation Network (SIMNET) and a series of Janus exercises conducted in May, June, July, and August. Training support products from the Force XXI training program, developed by the Directorate of Training Development, Ft. Knox were used by 1st BCT in its preparation for the test. Specifically, the Battle Staff Training System (BSTS) and Combined Arms Operations at Brigade Level Realistically Achieved through Simulations (COBRAS) vignettes were used to train task force staffs. Ft. Knox, through a support contract, prepared the training support package for the training and for the LUT. The

LUT scenarios were used throughout the training period. Ft. Hood terrain was used in the training. 1st BCT Commander, at his discretion, introduced changes to the planned scenarios to enhance training.

During the period 10-14 August AE5 supported a DTX using the planned Janus exercise, which focused on Step 3 staff training for the 1st BCT staff. AE5 provided a support package that included the personnel and equipment to conduct dynamic AARs and a Mission Planning and Rehearsal Tool (MPRT) used to conduct digital rock drills. At the completion of the 1st BCT Janus Exercise, 10-14 Aug 98, the 1st BCT Commander's training objective was to have reasonably competent staffs. Reasonably competent staffs are those staffs who can:

1. Produce an order, in a timely fashion, that might work.
2. Track the battle.
3. Make recommendations to their respective commanders.

The DTX used an MPRT provided by AE5 to conduct a digital rock drill and analyze the COA that would best accomplish the objectives. The MPRT was composed of 1 ModSAF workstation, 1 Simulyzer workstation, 1 MetaVR stealth, and 2 Liquid Crystal Display (LCD) projectors. The ModSAF workstations were Pentium 200MHz PCs with 128 MB of Random Access Memory (RAM), running Linux Operating System (O/S) for the ModSAF 4.0 application. Simulyzer was run on a Silicon Graphics Industry (SGI) Indy and the MetaVR stealth was run on a Pentium PC. The LCD projectors were Sharp models XG-3000U. The ModSAF Plan View Display (PVD) was displayed on one projector and the MetaVR three-dimensional view was displayed on the second projector.

The systems were networked together on their own LAN for synchronization of the displays. The Simulyzer was used to record the planning process and then facilitated playback of the mission for review and calculation of attrition rates for a given COA. The scenarios were previously laid out on ModSAF allowing the S-2 (Intelligence Officer) and S-3 (Operations Officer) to review the lanes they had selected for the mission. ModSAF allowed interoperability and line-of-sight calculations while the MetaVR stealth allowed terrain feature analysis and line-of sight visualization.

3.3.3 DTX Lessons Learned

The DTX AARs were accomplished by using the Digital Collection, Analysis, and Review System (DCARS) and the DAART system. The DTX exercise was a Janus driven simulation with the Janus Analyst Work Station (JAWS), showing ground truth of the battle, displayed on the center screen of the AAR room, DCARS or the 6 channel DAART on the left screen, and the 12 channel DAART displayed on the right screen.

Before each mission the objectives of the mission were written. After each mission, AARs were conducted.

"For AAR #1 the objectives of the mission were to paint the enemy positions, use Arty/Close Air Support (CAS) and use fixing forces. AAR#1 Teaching Points were: Why did the enemy

surprise us? See them deep/kill them deep. Why didn't we get more effective use of indirect fire? Did we properly position fixing forces? The learning process included awareness of 1-66 being an analog company and the 1-22 being a digital company and how they interact.

For AAR #2 the objectives of the mission were: How did we do at Line of Departure (LD) – Scouts/Mortar/Arty – trigger positions, MCS and ASAS feeds from BDE to BN to FBCB2, and air defense. AAR #2 Teaching Points: Did we set the conditions for success at LD, reconnaissance/task force/scouts/arty? Were we effective with the use of indirect fire/CAS? Was MCS/ASAS of use? Was air defense effective?

For AAR #3 the objectives of the mission were to: produce reasonably competent staffs – to get lethal Platoons and Company teams to the right place at the right time; produce an order in a timely fashion that might work; track the battle; and make recommendations to the Commander at critical points in the battle. AAR #3 Objectives: Use of indirect fire (timing/priority), rate of movement, CAS, tracking enemy with focus on intelligence. AAR #3 Teaching Points: How did we do with getting lethal platoons and company teams to the right place at the right time? How did we do with the "paradigm" –See them deep /Kill them deep? How did we do with maintaining a relevant common picture? Stress Situational Awareness, Situational Understanding, and Situational Dominance."[2]

The most productive AAR multiplexed the DAART images into 4 sections allowing comparison of BDE to BN MCS and BDE to BN ASAS. The BDE Commander was able to make the teaching point of a common relevant picture being crucial to situational awareness and understanding.

The use of new AAR tools, while an improvement, must also be introduced to the O/Cs with enough time to understand the AAR tool capability. The AAR tools and O/Cs must work in conjunction to produce an effective AAR.

3.3.4 CCTT and AVCATT/A Hypotheses

The AE5 hypotheses were not directly assessed during the CCTT and AVCATT/A exercise.

3.3.5 CCTT and AVCATT/A Experiment Design

AE5 supported the integration of CCTT with the AVCATT/ARMS devices for use during the 4th Brigade combat team training exercise held at Fort Hood from 7-24 July 1998. The AVCATT/A devices were the Reconfigurable Tactical Trainers (RTTs) which can be configured as an AH-64, OH-58, or UH-60. The RTT devices were in a mobile unit containing 3 simulators and an AAR area. The CCTT/AVCATT-A integration addressed the Fiber Distributed Data Interface (FDDI) to Ethernet protocols, multicast to broadcast format, exercise control and simulator initialization, terrain database correlation, communications between simulators, and the ModSAF vs. CCTT SAF issues. The ability to move, shoot, and

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[2] From the FBCB2 LUT train-up AARs conducted by Colonel Lynch, 1st BDE/4ID Commander.

communicate between the CCTT simulators and the AVCATT-A simulators will decide the success of the integration/interoperability.

3.3.6 CCTT and AVCATT/A Lessons Learned[3]

"The CCTT/ Battle Space Integrated Concept Emulation Program (BICEP) exercise, conducted 10-24 July 1998 at the Ft. Hood CCTT site, was the first large-scale exercise linking CCTT and virtual aviation simulators. Important lessons were learned which will help prepare the BICEP simulation devices, also referred to as AVCATT/A and others for the issues that are encountered when linking into the CCTT environment. Overall, level of interactivity achieved and thus the training exercise itself, was highly successful. It is not known at this time whether the BICEP devices will eventually adopt the Broad Agency Announcement (BAA) contract approaches to CCTT interoperability or further evolve the gateway approach. Regardless, we have discovered that CCTT and BICEP can be made to move, shoot, and communicate on the battlefield and provide some meaningful collective training under the right scenario controls.

Despite the success of the CCTT/BICEP exercise, in the future, an effort must be made to quantify the level of "Interactivity" or "Interoperability" or whatever term we are using to describe the interplay between simulations at the time. The budgetary climate in which we perform these exercises often does not allow a focused effort to quantifying interoperability. It might come as a surprise to discover the true level of interoperability achieved during these exercises as measured by qualitative indicators like those identified in the CCTT Interoperability Description Document. A large body of work exists, performed at tremendous expense to the Department of Defense (DoD), which outlines how a "fair fight" might be achieved, with heterogeneous simulations. It would be to our benefit to utilize some of this work to realize a deeper understanding of how well our exercises really work and what can be done to improve them."[3]

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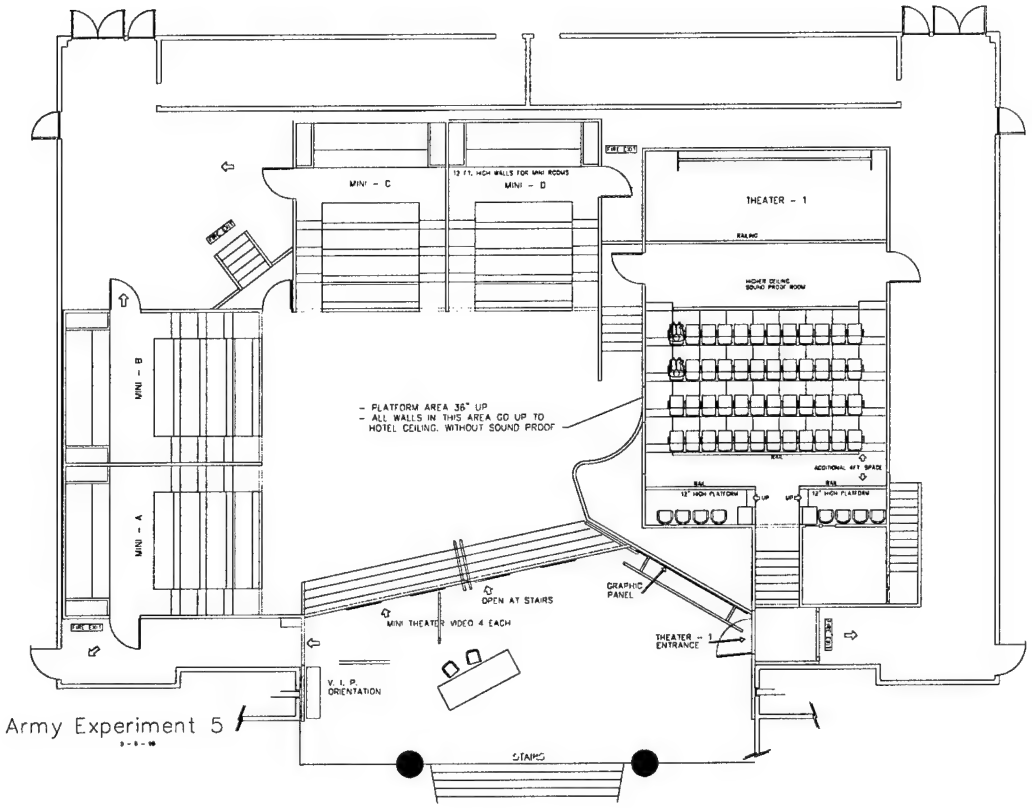
[3] From Mike Wright, STRICOM Engineer, CCTT and BICEP exercise description, dated 9/4/98.

4. AUSA PRESENTATION

4.1 OVERVIEW

The AE5 presentation was held at the AUSA Conference in the Cotillion Ballroom of the Marriott Wardman Park Hotel in Washington, DC 12-14 October 1998. The AE5 presentation showcased the results of the AE5 experiments held in June, July and August. The Cotillion Ballroom layout is shown in Figure 4.1-1 below.

Figure 4.1-1 AE5 Cotillion Ballroom Layout



The facility is composed of three major areas: the reception area, the main theater area, and the presentation theater area. Traffic flow is counterclockwise through the reception area, the main theater and the presentation theaters. Each area is summarized below in paragraph 4.1.2.

4.1.1 Theater Layout

The reception area (Figure 4.1-1, lower middle) consisted of a reception desk, a VIP briefing area, and a video wall with a brief overview of ATCCS. The main theater area (Figure 4.1-1, upper right) featured a video presentation emphasizing the need for the Force XXI Army to exploit the changing nature of warfare in the information age. Metro Video Productions (MVP) developed the scripts and the final videos for each theater. The presentation theater area (Figure 4.1-1, upper left) featured four presentation theaters describing Combined Arms Collective Training, Home Station Training, Institutional Training, and Leader Development Training. The Combined Arms Collective Training used the CCTT and AVCATT/A exercise as the basis for the video. The Home Station Training used the Fort Hood DTE for FBCB2 LUT train-up as the video material. The Institutional Training centered on the DLRC and the Leader Development Training used the Decisive Action course material.

4.1.2 Flow/Timing

The flow through the exhibit was counterclockwise from the reception desk/ticket request area to the main theater and then from the main theater to the presentation theater staging area. At this point, each of the four presentation theaters could be viewed. The main theater video ran on a 20-minute cycle with the video lasting 17 minutes. The presentation theaters ran on 10-minute cycles with the video lasting 6 minutes. The exhibit was open Monday, 12 October, from 1000 to 1800 hours, Tuesday from 1000 to 1800 hours and Wednesday from 1000 to 1930 hours.

4.1.3 CD-ROM

The AE5 booth supplied a take away package including fact sheets and a CD-ROM. The CD-ROM provided a guided tour of AE5 describing the goals and accomplishments, an innovative training wargame titled Decisive Action, a link to the AE website at http://www.armyexperiment.net, an ABCS primer including an introduction to the primary command and control systems used by the Army, and an AE5 multimedia screen saver.

4.1.4 Audio/Video Support

The audio/video (AV) support for the rehearsals and the demonstration was provided by Image Technical Services, Inc. (ITS). The main theater video was shown with an Electrohome Roadie LCD projector and the presentation theaters each had three Sharp LCD projectors.

4.1.5 Exhibit Construction

Exhibit Crafts, Inc. built the exhibit and was responsible for the installation and disassembly of the booth for the AUSA presentation. Ulf Helgesson Industrial Design was responsible for the booth layout and design.

4.1.6 VIPs/Reception Plan

The AE5 guides moved the VIPs and party over to the VIP briefing plasma panel and conducted an overview of AE5 and the exhibit. The guides then escorted the VIPs to the

main theater, provided the VIP party with the tickets, and ensured the party got seated in the correct VIP area. The VIPs attended the main video and then met the AE5 guides to escort them through the presentation theaters. Following the presentation theaters, the VIPs lead by the AE5 guides, then exited to the reception desk and provided their mailing address to receive the post AE5 video via postal mail.

4.1.7 Communications Plan Summary

The AE5 communications plan had 4 main objectives. 1. Inform the general public about AE5. 2. Inform the military community of the experiment and encourage attendance at both the symposium and the AE5 exhibition. 3. Provide on-site information products that increase exhibit traffic flow during the symposium. 4. Integrate, support, and execute the AE5 portion of the Army's Strategic Communication (STRATCOM) plan.

1. General Public. Informed the general public of the AE through the use of both Department of the Army (DA) and TRADOC Public Affairs Office (PAO) established relationships. Prepared a general use press release for the PAOs to distribute and generate public interest. Responded to specific requests for more information on a case by case basis with either a custom made press kit or publication article.
2. Military Community. Informed the military community of the experiment, presented the main messages, and encouraged attendance at both the symposium and the AE5 exhibition. Efforts in this area included inserting of an information paragraph in the CSA weekly distribution, leveraging off of AUSA efforts with articles in AUSA publications, establishing links to the AE5 homepage from other military home pages, and assisting the PAO with derivation of a general public press release.
3. Information Products. Provided on-site information products that increased exhibit traffic flow during the symposium, including five on-site products with an AE5 overview and directional guide to the exhibit. Plasma displays with an overview and direction map to the exhibit were installed in the hotels. A two-minute video version of the main theater video for playing on internal hotel channels was provided. An AE5 poster was placed at the tunnel exit between hotels. Three AE5 interactive kiosks with a video promotional clip, directions to the Cotillion Ballroom, an AE5 guided tour, and video request form was placed in the Marriott and Omni.
4. Army STRATCOM. Integrated, supported, and executed the AE5 portion of the Army's Strategic Communication (STRATCOM) plan. This effort included co-drafting of VIP invitational letters and other products as worked out with the STRATCOM director. (AE5 exhibit operations plan addressed the RSVP, scheduling, and escorting of VIPs.)

In order to continue promoting AE5, post exhibition efforts have included continuing the emphasis on the Army Experiment series and the awareness of AE5 contributions. Products in this category include exhibit take-away folder, one page handouts for AE5 overview and each mini-theater, the AE5 Compact Disk – Read Only Memory (CD-ROM)/Jewel Case insert, and the post exhibit video.

5. DELIVERABLES/RESIDUALS

AE5 produced a number of residual, leave-behind capabilities. These residual products can be grouped into two categories: those with the potential for immediate, tangible impact on the way the Army conducts SA training and those that are intangible, relating indirectly to SA training. Both are discussed below.

The tangible results are summarized in Table 1 below. Each result is placed into a category based on its support for the development of Doctrine, Training, Leader Development, Organization, Material or Soldier Systems (DTLOMS).

Table 1 - Tangible Results from AE5

Category	Tangible Results	Description and Potential Uses
Doctrine	Not Applicable	
Training	AE Strategy Plan	The future development for AE6, AE7, and AE8 is defined in the AE Strategy Plan. The plan identifies the areas where further training and study would provide the most value to the Army. Strike Force appears to be the likely focus for AE7.
	Digital Leaders Reaction Course Proof of Principle	The DLRC proof of principle was assessed as a low overhead, low cost training environment to train leaders to visualize the battlespace and make tactical decisions in a time-constrained digitized environment.
	Training Process for Leaders of Digitized Units	The 3-step training process became a digital learning strategy within TRADOC, based on results from the DLRC DTE and 1/4ID DTX.
	Assessment of AAR systems	The use of Vision XXI, DCARS, and DAART, combined with mentors and O/Cs substantially enhanced the AARs provided during the DTX and the DTE. Further O/C training with the systems will provide more benefit to the duringAAR discussions. The AAR is a more valuable learning experience by displaying both the simulation ground truth and perceived truth from ATCCS, as well as video of commander / staff interactions.
	Mission Planning and Rehearsal Tool	The MPRT proved a valuable tool for digital rock drills and allowed the S-2 and S-3 to analyze the outcome of a given COA. A transportable MPRT would be of great benefit

Category	Tangible Results	Description and Potential Uses
		to the TOC.
	CD-ROM with Decisive Action Simulation	The CD-ROM with Decisive Action allows leaders to practice the decision-making skills on their own PC. Also included on the CD-ROM is an ABCS primer that provides information on the ABCS systems.
Leader Development	DLRC Training Facility	The establishment at the WARLAB of the DLRC classroom provides the location for leaders to experience the DLRC Proof of Principle training.
	Leader Execution Drills	The steps required for proficiency in ATCCS requires repeated use of the leaders' skills in a well-defined sequence. The DLRC proved the validity of training using the 3-Step process.
Organization	Not Applicable	
Material	DAART 12 channel system for the WARLAB	The DAART system allows the O/Cs to record and playback key decision points during an exercise. The ability to compare ATCCS images simultaneously is a great advantage during AARs.
	Post AE5 Video	The post AE5 video highlights the training results and lessons learned from conducting AE5.
	HLA RTI interface with Eagle-ModSAF and ATCCS	The advantage of the HLA interface is to allow the simulation to stimulate the ATCCS suite, and for orders to be implemented through ATCCS, MCS specifically, into the simulation (2-way interface). The benefit is additional realism where the ATCCS do not require external stimuli to provide the leaders the cues necessary for making tactical decisions.
	Eagle ASAS link via Tactical Simulation Interface Unit (TSIU)	The Eagle-ASAS link provides automated intelligence input for the simulation.
	Army Experiment Website	The AE5 website offers information of previous AE's, allows for posting of latest information for the general public, and serves as a planning tool for AE members to coordinate, track and execute actions.
Soldier Systems	Not Applicable	

Some of the most significant results of the AE5 program were in the form of intangible benefits. The AE5 experiments were monitored by a number of military and civilian subject matter experts whose observations make up a large part of this report. Table 2 provides a summary of intangible benefits from the AE5 experiments.

Table 2 - Intangible Benefits from AE5

Category	Intangible Benefit	Description and Potential Uses
Doctrine	Not applicable	
Training	Training Assessment	The training assessment results provided by MITRE will allow the Army to develop specific training programs for the ATCCS systems in order to help soldiers develop the skills required for ATCCS operation. Many training programs will be developed using the 3-Step training process that AE5 validated.
	CCTT and AVCATT/A Interface	The CCTT and AVCATT/A interface allowed ground and air crews to train simultaneously in a collective training, virtual battlefield environment.
Leader Development	Leader Execution Drills	The DLRC leader execution drills were designed to teach leaders to visualize the battlespace and make timely tactical decisions.
Organization	Not Applicable	
Material	Not Applicable	
Soldier Systems	Not Applicable	

6. CONCLUSIONS/KEY RECOMMENDATIONS

This section is provided to assist with planning and execution of follow-on efforts.

All six of the objectives were met with the execution of AE5. AE5 proved the value of establishing a DLRC based on the results from the DTE at Fort Leavenworth. The staffs that received all three steps of the training process adapted much more quickly and functioned better together during the exercises. The AAR tools proved valuable for making the instructional teaching points. The O/Cs must be familiar with the AAR tools to produce the most effective AAR. The Vision XXI and DAART demonstrated the capability required to support the DLRC AARs.

The training that AE5 provided for the 1st BDE at Fort Hood prepared the Soldiers for the FBCB2 LUT. The AARs at the DTX were well supported with DCARS and DAART. The BDE Commander took full advantage of the capabilities provided by DAART to compare the BDE to BN MCS and ASAS. The learning point of a common relevant picture proved the importance of situational awareness, situational understanding and thus situational dominance. The benefits of training leaders on digital equipment, and then executing missions in a digitized environment that challenges them to make timely tactical decisions cannot be over emphasized. The need for an MPRT was also satisfied, at least partially, with the tools provided by AE5. The future AE programs should continue to investigate the possibilities of improved MPRT tools using the latest technology. The AE5 MPRT was not designed as a readily transportable system to move into the field. The need is evident for an MPRT that can move with the TOC.

The Strategy Plan details the follow-on strategy for AE6, AE7 and AE8. The recommendation is "that AE6 be built around the modernization of the Light Digitized Force and continue to support the training of the Mechanized Force at Fort Hood".[4] The future As should also continue to include commander and staff training.

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[4] From ADST-II-CDRL-AE5-9800350, written by MG(R) Craig Hagan, O'Connell and Associates.

APPENDIX A - Participating Organizations

Responsibility for AE5 resides with the Army Training and Doctrine Command (TRADOC), Deputy Chief of Staff for Training (DCST). Lockheed-Martin Corporation (LMC) served as the primary systems integrator—under the direction of the Army's Simulation, Training and Instrumentation Command (STRICOM)—as part of the Advanced Distributed Simulation Technology II (ADST II) Program. The MITRE Corporation provided technical direction and consulting services and analyzed the experiment results.

Government organizations:

1) U.S. Army Training and Doctrine Command (TRADOC) – Fort Monroe, VA
2) U.S. Army Simulation, Training, and Instrumentation Command (STRICOM) – Orlando, FL
3) U.S. Army Command and General Staff College, Combined Arms Center – Fort Leavenworth, KS
4) U.S. Army National Simulation Center (NSC) – Fort Leavenworth, KS
5) Electronic Proving Ground (EPG) – Fort Lewis, WA
6) U.S. Army Training Support Center (ATSC) – Fort Eustis, VA
7) U.S. Army Research Institute (ARI) – Alexandria, VA
8) 1st and 4th Brigades, 4th Infantry Division (Mech) – Fort Hood, TX
9) TRADOC Analysis Center, White Sands Missile Range (TRAC-WSMR) – WSMR, NM
10) U.S. Army Battle Command Battle Lab (BCBL) – Fort Huachuca, AZ

Contractor organizations:

1) Lockheed Martin Information Systems (LMIS) – Orlando, FL
2) Lockheed Martin Services Group (LMSG) – Orlando, FL
3) Lockheed Martin Electronics and Missiles (LME&M) – Orlando, FL
4) O'Connell and Associates (OCA) – Williamsburg, VA
5) AEgis Research – Orlando, FL
6) Science Applications International Corporation (SAIC) – Orlando, FL
7) MITRE Corporation – McLean, VA
8) Aeronautical Radio, Inc. (ARINC) – Annapolis, MD
9) Thompson, Raymo, and Wooldridge (TRW) International – Fort Knox, KY
10) Logicon – Fort Lewis, WA
11) Sherikon – Orlando, FL
12) Tapestry Solutions, Inc. – San Diego, CA
13) Metro Video Productions (MVP) – Norfolk, VA
14) Image Technical Services, Inc. (ITS) – Orlando, FL
15) Ulf Helgesson Industrial Design – Woodland Hills, CA
16) Exhibit Crafts Inc. (ECI) – Newport Beach, CA

APPENDIX B - Points of Contact (POC's)

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Mr.	Kirby	**Brown**	AEGIS Research Corporation		1-888-540-2493 (pager)		**Kbrown@aegisrc.com**
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MAJ	Tom	**Chapman**	Maneuver Support Battle Lab, Ft. Leonard Wood, MO	676	(573)563-4082	4083	**chapmant@wood.army.mil**
Mr.	Oscar	**Chappel**	MITRE		(913) 684-9173		**ochappel@aol.com**
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APPENDIX C – Acronym Listing

A

AAR – After Action Review
ABCS – Army's Battle Command System
ADST II – Advanced Distributed Simulation Technology II
AE5 - Army Experiment 5
AFATDS – Advanced Field Artillery Tactical Data System
AMDWS – Air and Missile Defense Workstation
ARI – Army Research Institute
ARINC – Aeronautical Radio, Inc.
ASAS – All Source Analysis System
ATCCS – Army Tactical Command and Control Systems
ATSC – Army Training Support Center
AUSA – Association of the United States Army
AV – Audio/Visual
AVCATT/ARMS or AVCATT/A – Aviation Combined Arms Tactical Trainer / Advanced Reconfigurable Manned Simulator

B

BAA – Broad Agency Announcement
BCT – Brigade Combat Team
BDE – Brigade
BDM – BDM Information Services
BICEP – Battlespace Integrated Concept Emulation Program
BLITCD – Battle Lab Integration, Technology, and Concepts Directorate
BN – Battalion
BOS –Battlefield Operating System
BSTS – Battle Staff Training System

C

C2 – Command and Control
C2V – Command and Control Vehicle
CAC – Combined Arms Center
CAS – Close Air Support
CCTT – Close Combat Tactical Trainer
CDRL - Contractual Data Requirements List
CD-ROM – Compact Disk, Read-Only Memory
CG – Commanding General

CGSC – Command and General Staff College
COA – Course of Action
COBRAS – Combined Arms Operations at Brigade Level Realistically Achieved Through Simulations
CO/TM – Company Team
CP – Command Post
CSA – Chief of Staff, Army
CSSCS – Combat Service Support Control System

D

DA – Department of the Army
DAART – Digital After Action Review Technology
DCARS – Digital Collection, Analysis and Review System
DCSCD – Deputy Chief of Staff for Combat Development
DCST – Deputy Chief of Staff for Training
DIS – Distributed Interactive Simulation
DLRC – Digital Leader's Reaction Course
DoD – Department of Defense
DTE – Digital Training Experiment
DTLOMS – Doctrine, Training, Leader Development, Organization, Materiel, and Soldier Systems
DTX – Digital Training Exercise

E

ECI – Exhibit Crafts, Inc.
EPG – Electronic Proving Ground

F

FBCB2 – Force XXI Battle Command for Brigade and Below
FDDI – Fiber Distributed Data Interface

H

HLA – High Level Architecture

I

ID – Infantry Division
IP – Internet Protocol
ITS – Image Technical Services, Inc.

J
JAWS – Janus Analyst Work Station

L
LAMTF – Louisiana Maneuver Task Force
LAN – Local Area Network
LCD – Liquid Crystal Display
LD – Line of Departure
LUT – Limited User Test

M
MCS - Maneuver Control System
MDMP – Military Decision Making Process
METT-TC - Mission, Enemy, Terrain, Time, Training & Civilian Considerations
ModSAF – Modular Semi-Automated Forces
MOPP – Mission Oriented Protective Posture
MPRT – Mission Planning and Rehearsal Tool
MVP – Metro Video Productions

N
NCO – Non-Commissioned Officer
NTC – National Training Center

O
O/Cs – Observer/Controllers
OPFOR – Opposition Force
O/S – Operating System

P
PAO – Public Affairs Office
PC – Personal Computer
PIU - Protocol Interface Unit
PVD – Plan View Display

R
RAM – Random Access Memory
RTI – Run Time Interface
RTT – Reconfigurable Tactical Trainer

S
S2 – Intelligence Officer
S3 – Operations Officer
SA – Situational Awareness
SAMS – School of Advanced Military Studies
SAF – Semi-Automated Forces
SIMNET – Simulation Network (predecessor of DIS)
SOP – Standard Operating Procedure
SOW – Statement of Work
STOW-E – Synthetic Theater of War – Europe
STRATCOM – Strategic Communication
STRICOM – U.S. Army Simulation, Training and Instrumentation Command

T
TAC – Tactical Command Post
TDA – Table of Distribution and Allowance
TOC – Tactical Operations Center
TRAC-WSMR – TRADOC Analysis Command -White Sands Missile Range
TRADOC - U. S. Army Training and Doctrine Command
TSIU – Tactical Simulation Interface Unit
TTPs – Tactics, Techniques and Procedures
TRW – Thompson, Raymo, Wooldridge International

U
UAV – Unmanned Aerial Vehicle
UCOFT – Unit Conduct of Fire Trainer

V
VIP – Very Important Persons

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